

# Examination of the Views of Class Teachers Regarding the Errors Primary School Students Make in Four Operations<sup>1</sup>

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**Abstract** Teaching of addition, subtraction, multiplication and division in mathematics starts from the first years of primary school. The learning output for four operations (addition, subtraction, multiplication and division) affects student success at every level of mathematics education from primary to higher education. At this point errors, misunderstandings and possible misconceptions of students need to be identified, eliminated, and the forms of instruction that prevent its formation need to be investigated. This study aims to identify the errors primary school students make in four operations according to the views of class teachers. The study was designed in the qualitative research design and the semi-structured interview form prepared by the researchers was used in the study. The study group consisted of 48 class teachers. It has been found out that students make more errors in adding, subtracting and multiplying decimal digits, and using zero in division. In addition, classroom teachers stated that the mistakes made in four operations result mostly from student, teacher, program and the student's family and environment respectively. Teachers made course content, teacher, student and family oriented suggestions to eliminate the mistakes in four operations.

**Keywords** Errors, Primary School, Four Operations, Addition, Subtraction, Multiplication, Division, Class Teacher

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## 1. Introduction

In our daily life, the need to use and understand mathematics is gaining importance and is constantly increasing. In a rapidly changing world, individuals who understand mathematics, use it in their lives and succeed in mathematics have more options in shaping the future [1, 2, 3].

With the changes that occur in our lives, mathematics and mathematics education need to be redefined and considered in line with the needs determined [4]. The changes that take place in the direction of the needs in mathematics education are reflected in the teaching.

The basis of mathematics teaching is the teaching of mathematical concepts. The concepts in mathematics follow a sequential and gradual sequence. For this reason, it is absolutely necessary to know what the mathematical concepts are, and more precisely, what they will be used for. Otherwise, knowing only abstract definitions cannot make meaningful learning happen. In order for this kind of learning to be possible, the relations of the mathematical concepts with the lower and upper concepts and their connections with each other must be revealed [5]. Mathematics program is based on the principle that *every child can learn maths*. Mathematical concepts are abstract in nature. When the level of children's development is taken into consideration, direct perception of these concepts is quite difficult. For this reason, concepts related to mathematics have been dealt with by way of concrete and finite models of living. In the program, importance is attached to the conceptual learning as well as the operation skills [4]. The teaching of concepts has an important place in the curriculum and there are different achievements from pre-school to the last grade of primary school for these concepts [6].

The understanding of a mathematical subject does not take place suddenly. It is a continuously evolving process which is reached at the end of the learning program [7]. It is a different process from the perception that is about the 'right' and 'wrong' answers in mathematics. It is certain that wrong answers are a difficulty known by everyone. We all have misconceptions; but labelling them as 'wrong' is unrecognizing these misunderstandings [8]. Misconceptions are often found in mathematics. These misconceptions occur throughout a child's education. Some take place due to the

nature of the child; others are the results of the teaching technique. Researchers agree that it is difficult to overcome many misconceptions [9, 10, 11]. For this reason, before misconceptions occur, teachers must be aware of the causes of misconceptions that can occur in children's minds. The misconceptions that have been noticed should be focused on by studying more and doing examples [12]. Students experience difficulties when they have an incomplete or incorrect learning about mathematics, and this problem is reflected in the student's future education. Hence, problems occur in the upper learning of the student. As long as these problems remain unsolved, incomplete or incorrect learning in students becomes a misconception [13].

It is important to determine the difference between error and misconception. Both result in wrong answers. The reasons for the difficulties the child experiences will require different answers. An error can result from a misconception [14]. Errors can be made for many reasons. This can be the result of inattention, an instant pen shift, misinterpretation of symbols and texts, lack of experience, understanding and knowledge about mathematical subject, target and concept, lack of awareness and inadequacy in controlling the answer or misconception [15, 16]. Misconception is the product of a lack of understanding, and in most cases is a constant misjudgement of a rule or mathematical generalizations. When we look at a completed work, the best way to understand a misconception or other cause of an error is the frequency and consistency of the error [14]. On the frequency and consistency of errors, Cockburn [15] noted that common mathematical errors stem from teachers, students, and subjects. He revealed that the maths errors originating from the teacher and the student are caused by experience, expertise, knowledge and understanding, imagination and creativity, attitude and confidence and psychological situation. In addition, Cockburn [15] notes that mathematical errors stemming from the subject have occurred due to presentation, expressing and difficulty of the subject.

Errors and misconceptions constitute a barrier to children's learning mathematical concepts. As a result, it leads to low mathematical success. When mistakes and misconceptions are considered positively, these mistakes and misconceptions must be corrected and students should be assisted in the development of mathematical knowledge in their educational process. It is also important that teachers give instant feedbacks. Teachers play an active role in the causes of students' errors or in the wrong generalizations they make and in correcting them to reach the correct way [17].

The teaching of the four operations in mathematics education starts from the first years of primary school and four operations constitute the basis of many subjects that students will encounter during their education life. The learning output for four operations affects student success at every level of mathematics education from primary school to higher education. At this point errors, misunderstandings and possible misconceptions of students need to be identified,

eliminated, and the forms of instruction that prevent its formation need to be investigated.

### 1.1. Objective of the Study

This study aims to identify the errors primary school students make in four operations according to the views of class teachers. In the study, primary school students' errors in the addition, subtraction, multiplication and division were investigated. In addition, the researchers tried to get teachers' opinions about the causes of students making mistakes and the work done in eliminating these mistakes. It is important for pupils to acquire four mathematical operations in primary school and it is very important to determine the errors made in four operations and the causes of errors in order to make the teaching effective and to gain the aims. Starting from here, the sub-objectives of the research are as follows.

According to the views of primary school teachers, what are the errors primary school students make;

1. in the addition?
2. in the subtraction?
3. in the multiplication?
4. in the division?
5. What are the causes of errors in four operations (addition, subtraction, multiplication, division)?
6. What are the solution offers of teachers to solve the errors in four operations (addition, subtraction, multiplication, division)?

## 2. Materials and Methods

This section contains information on the pattern of the study, the study group, the data collection tool and the analysis of the data.

### 2.1. Study Pattern

The research was structured in accordance with the basic interpretive qualitative research design. This pattern, which can be used in all disciplines and application areas, is widely used in the field of education [18]. The basic interpretive qualitative research involves participants' experience, their perceptions in the process and their perceptions of four experiences. During the research process, the researcher intends to deeply understand the phenomenon, process, perspectives and world views of participants [19]. In this study, we attempted to deeply understand and interpret the participants' views and experiences about the errors in four operations, and aimed to reveal their awareness by looking at the answers given by the participants. The basic interpretive qualitative research design was used in this research to deeply understand and comment on the views of the class teachers on the errors that the students make in four operations, the sources of these errors and the solution offers to eliminate these errors.

## 2.2. Study Group

The criterion sampling technique, which is one of the purposeful sampling methods, was used to determine the study group. Since the subject of the study is the errors made by the students in the four operations, it was determined that the class teachers should have at least five years of seniority and one year training at each grade level. In order to identify the teachers who met these criteria, teachers were interviewed and the study group was established. 71 teachers were interviewed in the scope of the study in the district of Bağcılar in Istanbul. The study group consists of 48 class teachers who met the criteria and volunteered to participate in the study. 28 of the class teachers are female, 20 are male. 29 of the class teachers who constitute the study group have seniority of 5 to 9 years, 13 have 10 to 14 years and 6 have 15 years and over. 8 of these teachers are in the first grade, 11 in the second grade, 10 in the third grade and 19 in the fourth grade.

## 2.3. Data Collection Tools

The open-ended form prepared by the researchers and arranged in line with the views of the three field experts was used to reveal the errors of the primary school students in four operations and the solution offers of class teachers for these errors. There are six open-ended questions that participant class teachers are expected to answer in the form. Some of the questions in the form are as follows: 1) what are the errors that the students make in the addition operation? What kind of errors did you encounter? 2) What are the causes of the errors of the students? Why do they make these errors? 3) What did you do about the solution of these errors made by the students? What kind of solution offers did you find?

Necessary permission was taken before applying this form to class teachers. Schools that collaborated with researchers and participated voluntarily were preferred in the collection of data. The open-ended forms were applied by the second researcher to class teachers between 4 and 8 April 2016. It took the teachers 10-15 minutes to fill in the forms.

## 2.4. The Analysis of the Data

The data obtained were analyzed with descriptive analysis method. Descriptive analysis allows the obtained data to be explained and interpreted under pre-established themes and cause-effect associations to be established. In this analysis technique, data are presented according to the research questions [20]. In the analysis of the data obtained in the research, each form was coded as "E1, E2 ..." and the answers given to each question were read separately by the researchers. Teachers' responses to forms are separated according to common descriptions. The categories were determined by coding these descriptions. Frequency table was given in the description and interpretation of class teachers' views on each theme.

The categories were determined separately by the researchers and consistency was ensured. Later, the researchers came together to resolve the disputes, and then they passed to the report writing process in accordance with the joint decision. The subjects which the researchers agreed and disagreed on were determined. In order to determine the credibility of the encoders, the formula of  $\frac{\text{Consensus}}{\text{Dissensus} + \text{Consensus}} \times 100$  determined by Miles and Huberman [21] was used. As a result of this formula, the encoder reliability was found to be 84% and the encoder reliability was found to be consistent. Teachers' expressions are directly cited to ensure clarity.

## 3. Conclusions

This section includes findings related to four themes based on research questions. These themes are the errors students make in the addition operation, in the subtraction operation, in the multiplication operation, in the division operation, the causes of the errors in four operations and teachers' solution offers to eliminate these errors determined according to the opinions of the class teachers. The findings of each theme are presented with tables, and categories are included in the tables. In addition, descriptions of the categories in the tables are given under the table comments.

The responses to the question "What are the errors primary school students make in the addition operation according to the class teachers?" which is the first sub-problem of the research are given in Table 1.

**Table 1.** Teachers' views about the errors that primary school students make in the addition operation

Views	f
<i>Carrying errors</i>	45
Forgetting to add	40
Being unable to add the digits	3
Getting the wrong digits	1
Forgetting the digits	1
<i>Place value errors</i>	15
Cannot write the digits one under the other	12
Not knowing the exact value of the digit	1
Forgetting to add 2 digits both while adding the last digit	1
Confusing the digits while adding more than three numbers	1
<i>Counting errors</i>	13
Difficulty in rhythmical counting	12
Forgetting the numbers while doing addition by counting the fingers	1

According to Table 1, when the views of class teachers regarding the errors students make in the addition operation are taken into consideration, the most common four error sources in the addition operation are: "forgetting to add the digits (40)", "not being able to write the digits one under

another (12)", "difficulty in rhythmical counting (12)" and "not adding the digit to the result (3)". According to the opinions of the class teachers, the primary school students make the most errors in adding the digit, writing the digits one under another and rhythmical counting. When the errors related to the addition are divided into categories, there are three categories: carrying errors, place value errors and counting errors. Within these categories, it is seen that the most mistakes are carrying errors (45). Some examples regarding the views of class teachers regarding the errors students make in the addition operation are as follows:

E20: "They forget to add the digit while adding numbers with more than one digit."

E32: "When the students are adding more than two numbers, they cannot place the digits correctly one under another, therefore they get wrong sums."

E2: "They have trouble counting on top of number."

The responses to the question "What are the errors primary school students make in the subtraction operation according to the class teachers?" which is the second sub-problem of the research are given in Table 2.

**Table 2.** Teachers' views on the errors that primary school students make in the subtraction operation

Views	f
<i>Decomposition errors</i>	50
Being unable to subtract tens	20
Forgetting to subtract ten from the tens digit	17
When getting tens from the digits and tens are passed to the digits	6
Not being able to subtract from a number whose two or three digits are "0"	6
Unnecessary subtracting from tens	1
<i>Operational errors</i>	19
Subtracting the minuend from the subtrahend when the subtrahend is smaller	13
Subtracting the minuend from subtrahend	4
Forgetting to write the bigger number on top	1
Writing three numbers one under another and subtracting them	1
<i>Counting errors</i>	5
Backward rhythmical counting	5
<i>Symbolic errors</i>	3
Confusing the terms of subtraction	3

According to Table 2, when the views of class teachers regarding the errors students make in the subtraction operation are taken into consideration, the most common six error sources in the addition operation are: "being unable to subtract tens (20)", "forgetting to subtract ten from the tens digit (17)", "subtracting the minuend from the subtrahend when the subtrahend is smaller (13)", "when getting tens from the digits and tens are passed to the digits (6)", "not being able to subtract from a number whose two or three digits are "0" (6)", and "backward rhythmical counting (5)". According to the opinions of the class teachers, the primary school students make the most errors in being unable to subtract tens, forgetting to subtract ten from the tens digit, subtracting the minuend from the subtrahend when the

subtrahend is smaller. When the errors related to subtraction are divided into categories, there are four categories, decomposition errors, operational errors, counting errors and symbolic errors. Within these categories, it is seen that the most mistakes are the decomposition errors (50). Some examples regarding the views of class teachers regarding the errors students make in the subtraction operation are as follows:

E44: "They make errors in operations with tens digits."

E36: "They may forget that the tens digit reduce after subtracting from the tens digit"

E6: "Subtracting the minuend from the subtrahend when the subtrahend is smaller"

The responses to the question "What are the errors primary school students make in the multiplication operation according to the class teachers?" which is the third sub-problem of the research are given in Table 3.

**Table 3.** Teachers' views on the errors that primary school students make in the multiplication operation

Views	f
<i>Place value errors</i>	40
Not scrolling digits in two-digit multiplication	29
Confusing the order of digits in multiplication	4
Leaving the tens digit in the second multiplier un-multiplied	3
Writing the products in the wrong digit	2
When multiplying a two digit number with another two digit number, multiplying the ones digit by the other ones digit and tens digit by the other tens digit	2
<i>Operational errors</i>	36
Forgetting the digits in multiplication	14
Being unable to count rhythmically	12
Failure to transfer the addition to multiplication	8
Errors in the addition in the sub-operations when finding the result of the multiplication	1
Being unable to multiply a two-digit number with another two-digit number	1
<i>"0" errors</i>	2
Errors in the multiplication by 0	1
Adding the 0 wrongly in the multiplication of a number ending with 0	1

According to Table 3, when the views of class teachers regarding the errors students make in the multiplication operation are taken into consideration, the most common five error sources in the multiplication operation are: "not scrolling digits in two-digit multiplication (29)", "forgetting the digits in multiplication (14)", "being unable to count rhythmically (12)", "failure to transfer the addition to multiplication (8)", and "confusing the order of digits in multiplication (4)". According to the opinions of the class teachers, the primary school students make the most errors in scrolling digits in two-digit multiplication, forgetting the digits in multiplication, and rhythmical counting. When the errors related to the multiplication are divided into categories, there are three categories: place value errors, operational

errors and "0" errors. Among these categories, it is seen that the most mistakes are place value errors (40). Some examples regarding the views of class teachers regarding the errors students make in the multiplication operation are as follows:

E7: "They forget to scroll a digit in the multiplication of the numbers with two digits."

E35: "They may forget the digits in the multiplication operation like they do in the addition operation."

E14: "They get wrong results since they cannot do rhythmical counting correctly."

**Table 4.** Teachers' views on the errors that primary school students make in the division operation

Views	f
<i>"0" errors</i>	27
Failure to add "0" to the quotient	26
The error made by deleting the zero in-between	1
<i>Place value errors</i>	12
Starting to subtract from the ones digit, not from the number on the left while dividing	3
Starting the dividend from the ones digit	2
Writing the multiplication in the ones digit	2
If the divisor is not in the digit, failure to merge with the other digit	2
Failure to write all the digits in order after the first subtraction	1
In the case of dividing a two or three digit dividend by a one-digit divisor, dividing all the digits of the dividend at once	1
When a division is not done in the first digit, they have trouble in the other digits	1
<i>Operational errors</i>	10
Writing the number exactly in the quotient without doing multiplication after finding how many divisors there are in the dividend	2
Leaving the operation at half	2
Error made when looking for divisor in the remainder	2
Error in sub-operations related to multiplication	2
Error made when looking for divisor in the dividend	1
The quotient is not multiplied and subtracted from the divisor	1
<i>Counting errors</i>	2
Failure to count rhythmically backward	2

The responses to the question "What are the errors primary school students make in the division operation according to the class teachers?" which is the fourth sub-problem of the research are given in Table 4.

According to Table 4, when the views of class teachers regarding the errors students make in the division operation are taken into consideration, the main errors in the division operation are: "failure to add "0" to the quotient (26)", "starting to subtract from the ones digit, not from the first number while dividing (3)", "writing the number exactly in the quotient without doing multiplication after finding how many divisors there are in the dividend (2)", "starting the dividend from the ones digit (2)", "if the divisor is not in the digit, failure to merge with the other digit (2)", "leaving the operation at half (2)", "error made when looking for divisor in the remainder (2)", "error in sub-operations related to multiplication (2)", "failure to count rhythmically backward (2)", "writing the multiplication in the ones digit (2). According to the opinions of the class teachers, the primary school students make the most errors in adding "0" to the quotient and starting to subtract from the leftmost digit. When the errors related to the division process are divided into categories, there are four categories of errors related to "0", place value errors, operational errors and counting errors. Among these categories, it is seen that the most mistakes related to "0" errors (27). Some examples regarding the views of class teachers regarding the errors students make in the division operation are as follows:

E45: "They forget to write 0 to the quotient when the divisor is not in the dividend."

E16: "Errors arising when they do the subtraction not from the leftmost digit but from the ones digit"

E19: "Errors in re-dividing the remainder."

The responses to the question "What are the errors primary school students make in the four operations according to the class teachers?" which is the fifth sub-problem of the research are given in Table 5.

**Table 5.** Teachers' views on the errors that primary school students make in four operations

Views	f
<i>Student-originated</i>	86
Doing the operations carelessly	30
Failure to fully understand addition, subtraction, multiplication and division operations	11
Not reviewing the subject	8
Not listening to the teacher	5
Not solving enough questions	5
Wishing to finish operations immediately	5
Not knowing the exact value of the digit	4
Having an underdeveloped mathematical intelligence	3
Not complying with teacher's warnings and directives	2
Incomplete and missing knowledge of multiplication table	2
<i>Mislearnings</i>	2
Not having enough information	2
Failure to comprehend what is read	2
Having an underdeveloped operation skill	1
Incomplete learning regarding the numbers	1
Not reviewing the subjects at home	1
Lack of comprehension of tens and ones	1
Not loving the Maths lesson	1
<i>Teacher-originated</i>	19
Failure to concrete operations while transferring them to students	8
Rote learning based education system	4
Insufficient training on rhythmical counting	3
Insufficient equipment in lessons	2
Failure to use suitable methods and techniques in lessons	2
<i>Program-originated</i>	11
Limited number of maths lessons	5
Inadequate activities in the class within the time given in the program	2
Failure to spare enough time to subjects due to amplitude of subjects	2
Program is not suitable with students' level	1
Limited number of activities in the program	1
<i>Student's family and environment- originated</i>	6
Apathy of the family towards education	4
Failure to transfer the knowledge into application	2

According to table 5, class teachers stated that the errors that students make in four operations originate from the following: "student (86)", "teacher (19)", "program (11)", "student's family and environment (6)". They stated the main reasons that originate from students as follows: "carelessness (30)", "failure to fully understand addition, subtraction, multiplication and division (11)", "not reviewing the subjects at home (8)". As for the main reasons that originate from teachers, they stated the following reasons: "failure to concrete operations (8)", "rote learning based education" and "insufficient training on rhythmical counting (3)". As the reasons arising from the program, we encounter "limited

number of lessons (5)", "inadequate activities in the class within the time given in the program (2)", and "failure to spare enough time to subjects due to amplitude of subjects (2)". In addition, teachers stated that "apathy of students' families towards education (4)" is another factor leading to errors in four operations. According to the opinions of the class teachers, the errors that primary school students make in the four operations are caused by the student, the teacher, the program, the student's family and environment. The errors originating from the student are caused by carelessness, failure to fully understand four operations and students' not reviewing the subjects at home. The errors

originating from the teacher are caused by failure to concrete operations, rote learning based education and insufficient training on rhythmical counting. The errors originating from the program are caused by limited time and inadequate activities in the class within the time given in the program due to large classes. Apathy of families also play a role in the errors that students make. Some examples of class teachers' views regarding the errors students make in four operations are given below.

*E7: "inattention, hurrying up, failure to comprehend the subject, not reviewing the subject, not solving enough questions."*

*E15: "Limited number of Maths lessons, not concreting the subjects starting from the first grade and insufficient number of problems solved".*

*E19: "Failure to spare enough time to subjects due to amplitude of subjects."*

*E31: "Large classes, inability to care for the student one-to-one, not doing revisions, rote learning based education system."*

The responses to the question "What are the solution offers of class teachers to eliminate the errors primary school students make in four operations?" which is the sixth sub-problem of the research are given in Table 6.

**Table 6.** Teachers' solution offers regarding the errors that primary school students make in four operations

Views	f
<i>Suggestions regarding the content of the courses</i>	95
There should be more examples and revision	21
The course content should be concreted	12
The material should be bigger, understandable and sufficient	11
More time should be spared to rhythmical counting exercises	8
One-to-one exercises	7
Dramatization of the subjects	5
Using visual elements	5
Frequent revisions	5
Providing peer support within the class	3
More time should be spared to maths course	3
Progressive teaching method should be selected	2
Stories should be used	2
Students should be able to express with their own words	2
Covering the last digit while scrolling to the left in multiplication	1
Drawing sticks while dividing two-digit numbers	1
Solutions made by using problem statements becomes clearer	1
Learning by experience should be provided	1
Computer-Aided Instruction	1
Results should be compared and discussed	1
It is necessary to enhance the exercises for reading comprehension	1
Students should be able to get the logic of the operation	1
We need to teach four operations by making a comparison with each other	1
<i>Recommendations for teachers</i>	14
Examples should be given from daily life	2
Exercises to increase attention should be done	2
We need to make the lesson more interesting	2
We need to find and create different activities	2
We must destroy the perception "Maths is hard"	1
There should be more blank spaces in work sheets instead of more questions	1
We should get the students control the operations	1
We should warn the students not to hurry up	1
We should revise the ones and tens	1
We need to use attention-grabbing colour pencils	1
<i>Recommendations for students</i>	11
Student's belief that they can do must be supported	3
The student's active participation in the class must be provided	3
They need to do their homework complete	3
They should find the answers by means of mental pictures	2
<i>Increase of the interest of the family and routing the family</i>	7

According to table 6, class teachers stated solution offers regarding the errors that students make in four operations under for main headings: "the course content (95)", "teachers (14)", "students (11)", and "family (7)". Regarding the content of the courses, they stated "more examples and revisions (21)", "concreting (12)", "the material should be large and enough (11)" and "more time should be spared to rhythmic counting exercises (8)". As for teachers, they suggested "giving examples from daily life(8)", "attention-enhancing exercises (2) ", "making the lessons more interesting (2)" and "finding and creating different activities (2)". Regarding the students, they suggested "student's belief that they can do must be increased (3)", and "they must do their homework complete (3). In addition, teachers stated "the interest of families should be increased (7)" as a solution offer to eliminate the errors in four operations. To eliminate the errors primary students make in four operations, primary school teachers made suggestions regarding the course content, teachers, students and families. Teachers suggested that there should be more examples and revision in the lessons, subjects should be concreted and the material should be sufficient. Regarding the teachers, it has been suggested that examples should be given from daily life, attention-increasing studies should be done and lessons should be made more interesting. Regarding the students, it has been suggested that students' active participation in the class must be provided and students' belief that they can do should be increased. Some examples of the views of teachers regarding their solution offers to eliminate the errors made in four operations are given below.

*E33: "Subjects should be concreted and more examples should be done."*

*E36: "I worked privately with the students with lack of attention. I tried to do exercises to attract their attention. I got their friends tell the crux of operations. "*

*E38: "I gave examples from life to find solutions to errors."*

*E43: "I used a variety of materials to embody the concepts of four operations."*

*E5: "In order to minimize mistakes, I first concreted the subjects and tried to make them grasp the logic. I gave them opportunity to do plenty of examples. I sometimes told them stories. I first used materials before continuing with operations. Problem statements allow them to do error-free operations. "*

#### **4. Discussion and Conclusions**

This study aims to evaluate the errors students make in four operations in line with teachers' views.

According to the results of the research, when the views of class teachers regarding the errors students make in the addition operation are taken into consideration, the most common error in the addition operation is "forgetting to add the digit", in the subtraction operation, "failure to subtract

two or more digit numbers". In his study, Doğan [22] found out that errors that were mostly seen resulted from digits in the addition operation while in the subtraction operation; errors were mostly seen in subtracting from two or more digit numbers. The results are similar in this respect. In his study, Kubanç [23] found out that 1st, 2nd and 3rd graders had more difficulty in questions that included addition operation than subtraction and errors and misconceptions were seen more in 2 or more digit numbers than 1 digit numbers. According to Haylock and Cockburn [24], errors in the addition operation usually occur when children are working with formal written methods involving an addition of numbers such as 26+37, especially when they try to transfer one digit to the other digit. According to Sadi [12] addition is easier than other four basic arithmetic operations. The two most common errors made in relation to addition are due to the lack of understanding of the digit value concept and placing the numbers vertically on the digits.

According to the results of the research; given the views of classroom teachers regarding the mistakes that students make in the multiplication operation, the five most common error sources are: "scrolling digits in the multiplication of two digit numbers", "forgetting to add digits", "failure to count rhythmically", failure to transfer addition to multiplication", and "confusing the order of digits in multiplication". When we look at the opinions of the class teachers about the errors made by the students in the division operation, the main errors in the division operation are "failure to add "0" to the quotient", "subtracting not from the first digit but from ones digit in the division", "writing the same number without multiplication after finding how many divisors the dividend has", "leaving the operation at half", "errors made while finding how many divisors remainder has", "error in sub-operations related to multiplication", "failure to count rhythmically backward" and "writing the multiplication under ones digit". In his study, Kubanç [23] discovered that students had more difficulty in division than the multiplication operation with respect to the success of the schools and the class levels. Considering the success of the schools, there was no significant difference in the 2nd graders in terms of the type of operation and that the 3rd graders in the most successful school had more difficulty in the multiplication process while the 3rd graders in the most unsuccessful school had more difficulties in the division operation. It has been seen that the errors and the misconceptions in the division operation are less than the addition, subtraction and multiplication operations. In his study, Doğan [22] discovered that the error rate in the multiplication process is higher, and the reason for this is that the operation is more complex than the other operations and that it includes many rules within itself. According to him, the most common mistakes in this operation result from failure to fully understand the logic of multiplication operation and forgetting to add digits or adding more than necessary digits. In the division operations, the errors are made mostly because the digit values of the numbers are not



used in the correct place. The error rate increases especially when the divisor is a two or more digit number. In addition, it has been seen that students make many errors while they try to find how many divisors a two or more digit dividend has. It is seen that the most errors are made in the multiplication operation, then the division, subtraction and addition operations. In their study called common arithmetic difficulties students experience in four operations, Varol and Kubanç [25] brought together studies that examine the difficulties students experience in four operations. The study which examines both domestic and foreign sources found that students often had difficulty with four operations in mathematics, mostly due to the lack of knowledge of digits and grouping concepts. Errors and misconceptions in two or more digit numbers are more common than errors and misconceptions in single-digit numbers. One of the biggest reasons of the difficulties that students experience in the four operations of mathematics results from the confusion of the rules of addition, subtraction, multiplication and division, or improper memorization of these rules. Tirosh, Tsamir and Hershkovitz [26] found that students are more successful in addition and multiplication operations than subtraction and division operations according to teachers' views. In their study, Cockburn and Litter [27] investigated the emergence of early mathematical misconceptions of students and their views regarding mathematics. According to their research results, multiplication and division operations with zero have confusing properties.

According to the results of the research class teachers indicated that the errors students make in four operations result from "the student", "the teacher", "the program" and "the student's family and environment". Main student-originated reasons are "carelessness", "failure to fully understand the concepts of addition, subtraction, multiplication and division" and "not reviewing at home". As for the main reasons that originate from teachers, they stated the following reasons: "failure to concrete operations", "rote learning based education" and "insufficient training on rhythmical counting". The errors originating from the program are caused by "limited time" and "inadequate activities in the class within the time given in the program due to large classes" "limited number of lessons" and "failure to spare sufficient time to subjects". In addition, teachers stated that "apathy of students' families towards education" is another factor leading to errors in four operations. Tatar and Dikici [28] conducted a literature research in their study called learning difficulties in mathematics education. Their study revealed that learning difficulties in mathematics generally resulted from four main sources: the inadequacy in mathematics teaching, the abstractness of the subjects (inability of students to think abstract), the inability to interpret verbal expressions and the inadequacy of the level of readiness of the students. According to Cockburn [15], most of the teachers stated that they cannot express how and why they do what they do while others stated that they know exactly how to provide effective learning environments and

how to respond to unexpected situations.

According to Cotton [29], in research on teaching, teachers emphasize three forms of knowledge to make effective teaching possible. The first of these is knowledge of subject; the student must feel secure in terms of mathematical knowledge that he or she has in order to carry out effective teaching. Secondly, teachers should understand the program. In this way, mathematical ideas and concepts appropriate to the age groups to be taught should be determined. Thirdly, the teacher must choose appropriate strategies and activities to enhance mathematical thinking of the students.

According to the research results, class teachers suggested the solution offers regarding the errors students make in four operations under four main headings as "the content of the lesson", "teachers", "students", and "the family". Regarding the content of the lessons, they stated that "we should do more examples and revision", "we must concrete the subjects", "the material should be big and sufficient" and "more time should be spared to rhythmic counting exercises". Regarding teachers, they suggested that "examples should be given from daily life", "works to enhance attention should be done", "lessons should be made more interesting" and "different activities should be found and created". Regarding students, they suggested that "student's belief that they can do should be increased", "the active participation of the student in the lesson should be provided" and "they should do their homework complete". Furthermore, regarding the elimination of errors in four operations, teachers suggested that "the interest of families should be increased" and "there should be less subjects in the maths book". In their study, when Küçük and Demir [30], asked the teachers who work in the 6-8th grades in primary schools and who have completed their at least 10th years in the profession about the reasons why students experience difficulties in understanding and application in maths lessons, teachers' answers were rule-based teaching, students' apathy towards learning maths, large classes and the classes are not homogeneous, families are not interested in education, scientific mistakes in textbooks, ambiguities in textbooks, insufficient lecturing in textbooks and lack of sufficient details and examples.

In line with these results, it can be suggested to the teachers they do more addition operations with two or more digit numbers, more subtraction operations with two or more digit numbers, they give more importance to scrolling digits and rhythmical counting in multiplication operations, they spare more time to division operations that include adding "0" to the quotient and more importance should be given to start from the leftmost digit while doing subtraction in a division operation. In addition, it is suggested that teachers do more examples in the lessons, concrete the subjects, give examples of daily life, and make attention increasing activities. Regarding the mathematics program, it can be suggested to increase the number of activities and the duration of the courses. Aside from these, it may be suggested that the student's family and environment actively

take part in the education process. Researchers should conduct more researches regarding what needs to be done in order to determine the sources of mistakes and eliminate them.

## REFERENCES

- [1] Hope, M. (2007). Making math connections: using real-world applications with middle school students. Thousand Oaks, California: Corwin Press.
- [2] Ersoy, Y. (2003). Matematik okuryazarlığı-II: Hedefler, geliştirilecek yetiler ve beceriler. [http://www.matder.org.tr/index.php?option=com\\_content&view=article&id=65:matematik%20okur-yazarligi-iihedefler-gelestirilecek-yetiler-ve-beceriler-&catid=8:matematik-kosesi%20makaleleri&Itemid=172](http://www.matder.org.tr/index.php?option=com_content&view=article&id=65:matematik%20okur-yazarligi-iihedefler-gelestirilecek-yetiler-ve-beceriler-&catid=8:matematik-kosesi%20makaleleri&Itemid=172) adresinden 04.05.2017 tarihinde alınmıştır.
- [3] Işık, A., Çiltaş, A. & Bekdemir, M. (2008). Matematik eğitiminin gerekliliği ve önemi. Kazım Karabekir Eğitim Fakültesi Dergisi, 17, 174-184.
- [4] MEB. (2016). Talim ve Terbiye Kurulu Başkanlığı İlkokul (1, 2, 3 ve 4. Sınıflar) Matematik Dersi Öğretim Programı. <http://ttkb.meb.gov.tr/program2.aspx> adresinden 07.05.2017 tarihinde erişilmiştir.
- [5] Dede, Y. & Argün, Z. (2004). Matematiksel düşüncenin başlangıç noktası: Matematiksel kavramlar, Kuram ve Uygulamada Eğitim Yönetimi, 39, 338-355.
- [6] Erdoğan, A. & Özdemir Erdoğan, E. (2009). Toplama ve çıkarma kavramlarının öğretimi ve öğrenme güçlükleri. İçinde: E. Bingölbalı ve M.F. Özmantar (Editörler), İlköğretimde Karşılaşılan Matematiksel Zorluklar ve Çözüm Önerileri, 31-58. Ankara: Pegem A Yayıncılık.
- [7] Doğan, M. & Güner, P. (2012). İlköğretim matematik öğretmen adaylarının matematik dilini anlama ve kullanma becerilerinin incelenmesi. X.Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, Niğde, Türkiye.
- [8] Thompson, I. (2010). Issues in teaching numeracy in primary schools. Second edition, Berkshire: Mc Graw Hill.
- [9] Baki, A. (1998). Cebirle ilgili işlem yanlışlarının değerlendirilmesi, III. Ulusal Fen Bilimleri Eğitimi Sempozyumu. Karadeniz Teknik Üniversitesi, Trabzon, 23-25 Eylül.
- [10] Morali, S., Köroğlu, H. & Çelik, A. (2004). Öğretmen adaylarının soyut matematik dersine yönelik tutumları ve rastlanan kavram yanlışları. Gazi Eğitim Fakültesi Dergisi, 24(1), 161-174.
- [11] Taşkın, D. & Yıldız, C. (2011). Kesirlerde toplama ve çıkarma işlemlerinin öğretiminde common knowledge construction modele uygun materyal geliştirme. 2. International Conference on New Trends in Education and Their Implications, Antalya, 27-29 Nisan.
- [12] Sadi, A. (2007). Minconceptions in numbers. UGRU Journal, 5, 1-7.
- [13] Yılmaz, Z. & Yenilmez, K. (2008). İlköğretim 7. ve 8. sınıf öğrencilerinin ondalık sayılar konusundaki kavram yanlışları (Uşak İli Örneği). Afyon Kocatepe Üniversitesi Fen Bilimleri Dergisi, 8(1), 291-312.
- [14] Spooner, M. (2002). Errors and misconceptions in maths. New York: David Fulton Publishers.
- [15] Cockburn, A.D. (1999). Teaching mathematics with insight: The identification, diagnosis and remediation of young children's mathematical error's. London: Falmer Press.
- [16] Hansen, A. (2014). Children's errors in mathematics. Third edition, London: SAGE Publications.
- [17] Mohyuddin, R.G. & Khalil, U. (2016). Misconceptions of student in learning mathematics at primary level. Bulletin of Education and Research, 38(1), 133-162.
- [18] Merriam, S. B. (2013). Nitel araştırma: Desen ve uygulama için bir rehber. S. Turan (Çev. Ed.). Ankara: Nobel. [Orijinal baskı 2009].
- [19] Altheide, D. L. & Johnson, J. M. (2011). Reflections on interpretive adequacy in qualitative research. In N. K. Denzin, & Y. S. Lincoln (Eds.), The SAGE handbook of qualitative research (pp. 581-594). Thousand Oaks, CA: Sage Publications.
- [20] Miles, M. B. & Huberman, A. M. (1994). Qualitative data analysis (2nd ed.). Thousand Oaks, CA: Sage. Özden, Y. (1999). Öğrenme ve Öğretme (3. Baskı). Ankara: Pegem Yayıncılık.
- [21] Yıldırım, A. & Şimşek, H. (2013). Sosyal bilimlerde nitel araştırma yöntemleri. Ankara: Seçkin Yayınevi.
- [22] Doğan, A. (2002). Doğal sayılarla ilgili ilköğretim 1.kademe öğrencilerinin yaptıkları hata türleri. Yayımlanmamış Yüksek Lisans Tezi, Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara, Türkiye.
- [23] Kubanç, Y. (2012). İlköğretim 1., 2. ve 3. sınıf öğrencilerinin matematikte dört işlem konusunda yaşadıkları zorluklar ve çözüm önerileri. Yayımlanmamış Yüksek Lisans Tezi. Fırat Üniversitesi Eğitim Bilimleri Enstitüsü, Elazığ, Türkiye.
- [24] Haylock, D. & Cockburn, A. (2014). *Understanding mathematics for young children*. Los Angeles [etc.]: Sage Publications.
- [25] Varol, F. & Kubanç, Y. (2012). Öğrencilerin dört işlemde yaşadıkları yaygın aritmetik güçlükler. Turkish Studies - International Periodical For The Languages, Literature and History of Turkish or Turkic, 7(1), 2067-2074.
- [26] Tirosh, D., Tsamir, P. & HersHKovitz, S. (2008). Insights into children's intuitions of addition, subtraction, multiplication, and division. In A. Cockburn & G. Littler (Eds.), Mathematical misconceptions. New Delhi: Sage Publications.
- [27] Cockburn, A. D. & Littler, G. (2008). Mathematical misconceptions: A guide for primary teachers. London: Sage Publications.
- [28] Tatar, E. & Dikici, R. (2008). Learning difficulties in mathematics education. Mustafa Kemal Journal of University Social Sciences Institute, 5(9), 183-193.
- [29] Cotton, T. (2010). Understanding and teaching primary mathematics. Harlow: Pearson.

[30] Küçük, A., & Demir, B. (2009). A study on some misperceived concepts in the teaching of mathematics in 6th-8th grades.

Dicle University Journal of Ziya Gökalp Faculty of Education, 13, 97-112.

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